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Development of Inhibitors against Corrosion and Mineral Salts in Pipes on the Basis of Local Raw Materials

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Annotation: To create inhibitors against corrosion and mineral salts in pipes and to implement them by creating the necessary methods.

Keywords: The problem of creating inhibitors, corrosion, metal, oil, industry, ecology, steel.

Corrosion protection of metals arose with the beginning of the use of metals. Corrosion processes are related to the laws of nature that we cannot change. However, by studying these laws, we can reduce the harmful effects of corrosion. Methods of corrosion protection follow from its definition.

Corrosion decomposition of oil industry equipment is determined by the physicochemical properties of water and hydrocarbon parts of the system, their composition, quantitative ratio, the presence of dissolved gases (hydrogen sulfide, carbon dioxide, oxygen, etc.). In high-velocity flow, the phases mix intensively to form an emulsion-type water-oil mixture. When they stop, two separate phases are formed. In all cases, the corrosive medium is water.

Until recently, the accumulation of salts and the use of corrosion inhibitors was a new method, and thermal engineers had to confirm that it was advisable for manufacturers to use these technologies. Nowadays, inhibitory water treatment of heating networks is widespread, and many manufacturers offer their products that protect against corrosion and salt accumulation.

Hydrogen sulfide-carbon dioxide corrosion of steel is one of the most serious problems of oil and gas companies, as it is characterized by high aggressiveness of the environment due to the presence of hydrogen sulfide and carbon dioxide. The most reliable and cost-effective method is the use of universal corrosion inhibitors in this case, which not only reduces the corrosion loss of the metal, but also its hydrogenation, the deterioration of plastic properties. New types of liquid phase inhibitors used by oil companies are known, which are effective (reduce the corrosion rate at a concentration of 50-200 mg / l by 0.05 mm per year) and do not harm the environment (risk level 3-4).

However, families of volatile corrosion inhibitors that can effectively protect the metal not in a liquid but in a gaseous phase that binds to 100% relative humidity or hydrogen sulfide under close conditions have not been clearly developed. The most common and problematic for the oil industry are: carbon dioxide corrosion, hydrogen sulfide corrosion, and many other erosions.

Experience in combating corrosion with inhibitors shows that reliable operation of process equipment can be achieved. Nitrogen corrosion inhibitors have long and successfully been used in oil production and transportation. The most common of these are: primary, secondary, tertiary aliphatic, quinoline, imidazoline, pyridine-exchange compounds, and quaternary ammonium compounds, all of which contain oxygen groups.

The optimal solution to the problem of providing the industry with efficient and inexpensive,

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environmentally friendly corrosion and hydrogenation inhibitors is to develop inhibitors that operate in small concentrations and have a wide range of effects. To facilitate the introduction of inhibitors into the corrosive environment, they are often dissolved in mixed organic solvents, which do not worsen the environmental situation.

As a result of corrosion, high levels of environmental pollution and breakdown of technological equipment of the oil and gas industry, in particular, in industrialized countries, cause damage equal to 10% of national income.

The mechanisms of action and protective effectiveness of a number of inhibitors on carbon steel in water saturated with hydrogen sulfide and carbon dioxide have been studied. The inhibitors studied, in addition to stopping the general corrosion, lead to a decrease in the diffusion of hydrogen into the steel and contribute to the preservation of its plastic properties.

Electrochemical and gravimetric methods have been used to study the effect of salts of aliphatic amines (acetates and chlorides) on the corrosion of St. 20 steel in solutions containing various chloride ions. It has been shown that the protective effect of amines is enhanced by an increase in hydrocarbon radicals.

How long amines protect against corrosion has been studied. It is currently operating in chemical and coke plants with low evaporation coefficients in the water cycle (SDA). Calculations show that an increase in evaporation from 1.5 to 2.0 leads to a 3-fold reduction in river water consumption in the periodic water cycle and a 5 ... 7-fold reduction in the use of treated water. Given the high capacity of circulating water cooling systems, such changes in their operating mode lead to significant water savings and reduced wastewater flow.

An increase in the evaporation coefficient of circulating water leads to a proportional increase in its salt content, alkalinity, hardness, and concentration of suspended solids, organic and inorganic compounds. As a result, the process of biological pollution in the circulating water supply system has increased, making the recycled water more stable. Coarse substances introduced with these layers have low thermal conductivity and significantly disrupt the heat transfer process. As a result, the efficiency of the processes decreases, the quality of the product deteriorates, the loss of raw materials increases, and so on. Thus, simple changes in the evaporation coefficient in water treatment systems worsen the thermal regime of the heat exchangers, increase the stops for cleaning, and shorten the service life. Therefore, the issue of maintaining the stability of recycled water, reducing its corrosive activity and susceptibility to biogenic degradation has become particularly relevant in water supply practice. Currently, the most effective way to solve this problem is to use anti-corrosion and salt deposition inhibitors in the treatment of circulating water. There are two disadvantages to increasing the evaporation coefficient of circulating water and the use of corrosion and salt deposition inhibitors for this purpose and the use of open cooling elements (cooling towers). The first is the formation of inhibitory components in the treated water to stabilize its mineral content. This water is called purified and recycled in the industrial sewage system.

The second downside is the additional pollution of the atmospheric air by the dripping of moisture into the atmosphere from the cooling towers of the SDA. Therefore, inhibitors used in water treatment systems should have low toxicity as well as high efficiency in protecting heat exchangers from corrosion and sediment salts. In the absence of phosphonates, corrosion of carbon steels in a neutral environment is mainly in the form of wounds or pitting.

When phosphonates are introduced into an aqueous medium, the corrosion process becomes uniform. The technology of production of antifreezes based on a set of additives based on the composition of salts of carbonic acids is called carboxylate and or a new generation of liquid technology. Methods of synergistic combined use of carboxylate coolants in combination with organic inhibitors have been developed. To obtain a highly effective water-soluble scale inhibitor, it is proposed to introduce phosphonosuccin into the FBTK molecule and obtain a structure containing a sulfo group. Methyl ether FBTK and its salts can also be successfully used

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as a corrosion inhibitor in water supply systems. As a synergistic supplement, the authors suggest chloroethylphosphonic acid as Ca gluconate and OF. As a result, it was possible to increase the effectiveness of the inhibitor by 95% (89% in the absence of additives) at the found concentration of each component of the mixture. Along with the Fe-phosphonate complex, the protective film contains Fe-gluconate complex and Zn (OH) 2. It is recommended to use as a synergistic active composition to protect against corrosion and scale: phosphonosuccinate - oligomer with sulfomethylated acrylamide acrylates; NTF derivatives with amides and polymers, including acrylic acid derivatives with amide and sulfo groups; hydroxyphosphinacetic acid and its salts, NTF, EDTF, DTPF, diphosphonomethylglycine (DGMG), as well as polymers in the series of sulfoacrylates, etc .; water-soluble salt of molybdenum, stabilizer - terpolymer of acrylic acid.

NTF is one of the most effective reagents in a series of phosphorus-containing complexes. Thus, as in the composition of various compositions, this reagent is now widely used to stabilize water purification. With phosphon-K-methylenephosphonic substituted caproamide and a corrosion inhibitor, the NTF composition can be used successfully to clean carbon steel water intake systems with water. The stabilizing properties of the composition depend on its concentration in water, pH and water temperature.

Research over the last decade has aroused interest, which is related to the addition of molybdenum compounds to an inhibitory reagent or an attempt to increase the inhibitory efficacy in the presence of oxidizing agents. Thus, in industrial cooling systems, organophosphonates (OEDF, NTF, and EDTF), polyacrylic (polymethacrylic) acid, etc., zinc salts, molybdate are introduced into the inhibitor in the form of H2MoO4, Na2MoO4, to prevent corrosion of salt deposits and metal. The composition is offered as a multifunctional composition for cleaning industrial water cooling systems, 15 to 20% hydrogen peroxide, 1 to 20% hydroxyethyl diphosphonic acid, 0.5 to 5% molybdate, propylene glycol. This composition can be used to prevent scale, corrosion and biofouling. Hydrogen peroxide undoubtedly plays a biocidal role. In recent years, the attention of researchers has been focused on the creation of composite compositions based on polymers.

This, a scaling inhibitor containing simultaneous scale inhibitors (polyacrylates, phosphorylated polymaleic anhydride, OF: OEDF, NTF, DTPF, FBTK) and corrosion (amino acids: glycine, lysine, etc.) is proposed. In operation, "metol" - N-methylene-p-aminophenol sulfate is recommended as an effective additive. The use of different compositions and structures of organophosphonates is widely discussed, often related to complexes, their derivatives and compositions. This takes into account both known and new compounds.

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